DATA PROCESSING DIGEST

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Management Decision-making Techniques

ALLOCATION OF SALES EFFORT IN THE LAMP DIVISION OF THE GENERAL ELECTRIC COMPANY

Clark Waid, G. E. Co., Donald F. Clark, Russell L. Ackoff, Case Institute of Technology, Cleveland, Ohio
OPERATIONS RESEARCH, December 1956; pages 629-647.

As part of a reorganization of the General Electric Lamp Division, an OR project was undertaken "to determine the average number of accounts that should be assigned to salesmen." Although three areas of study were considered important to this project, "attention was directed initially to allocation of the salesman's time to a specified set of accounts," since it was easier to begin with this area than with the other two.

"Dollar volume of sales per year" was selected as the measure of effectiveness. A practical model was devised based on the assumption that "those accounts which react to sales time in the same way can be identified and classified." Then each account in the class would be represented by a point which would be sales volume for a specified year plotted against total sales time spent with a customer during that same year. A curve would be fitted, and it was anticipated that it would be a normal S-curve.

A list of account characteristics was compiled for classifying the accounts, and one sales district was selected for a trial run. Salesmen in the district assisted by interviewing their accounts and filling out a questionnaire of characteristics.

While this was being done, the available data was plotted in order to obtain a useful classification of accounts. More than a hundred different plots were made and analyzed. "Not a single account characteristic turned out to be significant.... this result did not even prove that increased numbers of calls cause increased dollar volume." It was felt either that dollar volume is not affected by the number of calls, or that the wrong account characteristics had been used. Since the researchers felt the first consideration was

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untenable, they began to look for other account characteristics, but without results. Finally, another idea came to them: "accounts were being saturated with sales calls and consequently the data obtained represented random fluctuations about the plateau of the sales-response curves. If this were so, it would follow that changes in numbers of calls per year (in the saturation region) should not be accompanied by changes in dollar volume."

A case study in operations research

Following this line of reasoning, accounts were classified by whether they had an increase or decrease in number of calls in 1953 as compared with 1952; then they were subclassified by whether they had an increase or decrease in 1954. "This [analysis] showed that accounts that received an increase (or decrease) in calls in one year were unaffected on the average by whether or not they received an increase (or decrease) in the succeeding years." Corresponding analyses were performed for the other two districts for which data were available, with similar results. "This suggested that some reduction in number of calls could have been made without reducing sales." How much?

"The maximum amount of reduction in calls that could be justified by the available data would result from cutting back, for each account, to the smallest yearly number of calls that it had received in the three-year period.... It was assumed that any further cutback would move the account off the sales-response-curve plateau and begin to decrease the dollar return from that account.... A further reduction than this could probably have been made for many accounts without decreasing their dollar volume."

A computation was made of the reduction in calls that would have occurred in 1954 had this rule been followed; from this figure it was easy to determine how many accounts, on the average, a salesman could handle. It was found that the existing sales organization would be able to handle the anticipated increase in business during the first of the five years under the new organization.

A final approach to the problem was made by examining the net changes in number of calls between 1952 and 1954. There was some indication "that there might be a lag in the response of dollar volume to changes in number of calls." A control procedure was required. This consisted of an annual multiple correlation analysis of changes in dollar volume that year with changes in number of calls for each of the preceding ten years. "If a significant correlation were found between dollar volume and separate or combined annual changes in calls, it would reveal any lag in response and, hence, start to give data of use in constructing sales-response curves."

The data collected for the purposes described above made it possible to perform other analyses. For example, a time study of one month's operations in District A revealed some interesting patterns: 1) Travel time was related to distance traveled only within wide limits; 2) Waiting time was apparently an insignificant propor-

tion of the total; 3) Interview time showed a rather stable relation to the type of account called upon; 4) "Administrative time" was a higher proportion of the total time than expected.

Other information obtained as a by-product of the project was an estimate of the dollars sold per sales call for each type of account (resulting in a modification of the accounting procedure); optimum number of calls on prospects (maximum of three calls would yield an increase of 11 to 14% in number of new accounts); and division of time between sales and service (suggesting the establishment of a service organization independent of the salesmen).

"At the end of the first year under the five-year plan, sales-volume objectives were met. The annual saving of not acquiring the additional number of salesmen originally recommended was approximately 25 times the cost of the study."

TEST OF AN INVENTORY CONTROL SYSTEM ON FERUT

J. H. Chung and C. C. Gotlieb, University of Toronto, Ontario
JOURNAL OF THE ASSOCIATION FOR COMPUTING MACHINERY, April 1957; pages 121-130

A Ferranti computer at the University of Toronto (FERUT), was used to simulate an inventory system prior to setting up the system for actual use. Actual orders which had been placed during a peak period in 1953 were used for the test.

Simulated system shows how inventory plan would work

The problem was to determine how best to fill the orders from a group of field warehouses and jobbers out of a central warehouse of Imperial Oil Limited in Toronto. Some of the orders would be filled from packaged items, but the few items which account for a large proportion of sales were stored also in tanks. Whenever possible, orders for these items were filled from tank storage. In addition, there were 28 fillers, mixers and blenders which could be used in supplying orders from base stock tankage considered as part of the refinery. Since 1300 items were stocked, it was an important part of the study to investigate the capacities of each piece of equipment.

A flow diagram was made showing the priority of daily activity as follows: the replenishing of warehouse stocks of items without tanks, the replenishing of warehouse stocks of items with tanks, the processing of orders for shipment to the field warehouses and jobber customers.

The inventory data for each item were stored on the magnetic drum, each item occupying eight lines. One binary digit was used to indicate the existence or absence of a tank for that product. Another binary digit on each of two additional lines was used to indicate the danger and the order points. A one in either or both of these positions

Print-out of the warehouse supply status

would indicate that the current inventory was at or below the critical level indicated, and therefore the appropriate ordering action had been taken. Packaged items with tank storage had a critical quantity stored in memory. This number was used as a criterion for determining whether a field order for that item should be filled from its stock on the warehouse floor, or from the tank storage by means of a filler. In this case, the system must decide how to use the available equipment to best advantage.

Field orders were read one at a time into the computer by punched tape, and stored according to tank orders or MB (mixer, blender) orders. Unfilled orders were printed out at the end of the simulated day, but were not stored in the memory because of limited storage capacity. The time required to simulate a day's operation averaged about ten minutes, including printing out expediting information and information about those orders which could not be processed. At the end of the day's run the computer checked the calculations by verifying that the inventory at the beginning of the day, increased by all the stock that flowed into the warehouse from the mixers and blenders, tallied with the inventory at the end of the day together with the total shipments during the day. Whenever the check failed, the day's operations were repeated. After the checking procedure, the computer printed out the filler capacities remaining, the daily volume passing through the fillers as shipments to jobber customers, the daily volume direct from the central warehouse to the field warehouses, the daily volume to the field warehouses via the fillers, and the daily volume from the mixers and blenders. Every two weeks, the computer printed a complete inventory of the stock in the warehouse summarized according to package size.

The results of the test showed that the inventory and filler capacity were sufficient to meet the daily demands. It showed, also, that the danger point feature was not a vital part of the system and this was dropped in the actual procedure which was set up. The test showed that there was enough stock on hand in the warehouse each day to fill on an average of 97% of the orders which set a goal for the actual operation. The test also proved that the actual operation of a supply center could be simulated very closely on the computer. By making order and sales information available daily to a computer, it would be feasible to investigate how any proposed changes in a system would affect its operation

((Flow diagrams of the computer program are included.))

THE SCOPE FOR OPERATIONAL RESEARCH IN INDUSTRY

Stafford Beer, United Steel Companies, England
THE INSTITUTION OF PRODUCTION ENGINEERS JOURNAL, May 1957; pages 298-320.

This is a scholarly and quite complete discussion of the meaning and use of operations research, with explanations of the techniques used, and the importance of the scientific method to management.

THOUGHTS ON LINEAR PROGRAMMING AND AUTOMATION

George B. Dantzig, The Rand Corporation, Santa Monica, California
MANAGEMENT SCIENCE, January 1957; pages 131-139.

Complex control functions by computer

The author probes the possibility of a "super automation" such as the technique of linear programing in which "machines replace complex human control tasks." This technique considers the entire system under study as "decomposable into a number of elementary functions called 'activities'; each type of activity is abstracted to be a kind of 'black box' into which flow tangible things such as supply, money, and out of which may flow the products of manufacture or trained crews for the military." A unit is selected for measuring the quantity of each activity; in a production type of activity, this quantity is measured by the amount of some product produced by it (activity level). "In the linear programming model the quantities of flow of various items into and out of the activity are always proportional to the activity level." For each item there must be a material balance equation, representing the flows into or out of the various activities. "The programming problem consists in determining values for the activity levels which are positive or zero such that flows of each item (for these activity levels) satisfy the material balance equations and such that the value of the payoff is maximum."

This philosphy of linear programing is demonstrated by a model of a refinery, a type of activity which has been prominent in the type of "super automation" suggested by the author. In fact, "linear programing is now used by nearly every large producer in the petroleum industry." Other already accomplished uses of this technique are distribution in the food industry, feed mix for cattle, decisions on making or buying parts, job scheduling for maximum equipment use.

"The greatest promise of rapid solution of the larger systems does not appear to depend on the development of bigger and faster computers and better instruction codes...but rather upon the classification of model structures and the development of special methods for each class."

General Information

ELECTRONIC COMPUTER STUDY OF ENGLISH SYNTAX PATTERNS

TECHNICAL NEWS BULLETIN, June 1957, pages 84-86.

The National Bureau of Standards has been conducting a study supported by the U. S. Patent Office of the statistical frequency with which different sentence structures are used in the English language. Such information is needed for a "better structural understanding of language in many data processing applications --in particular, the expression of information for mechanized searching of patents. In addition, structural research may ultimately yield useful techniques for machine translation of languages."

Analysis of English sentence structure aids in patent search

The first exploratory study covered only 550 sentences which were selected at random from scientific articles and books. It was hoped such a selection would "provide a maximum of straightforward, factual statements and a minimum of ambiguity and emotional or attitudinal factors." The sentences were marked manually with a code which had the following significance: 1, subject; 2, object (direct or indirect); 3, predicate nominative; 4, adjectival modifier; 5, adverbial modifier; 6, verb. Each code was further categorized into A for lexical units, B for a phrase, and C for a dependent clause. For verbs (code 6), the letters stand for main, auxiliary, and modal auxiliary, respectively. Elements that did not affect the basic structure of the independent clause were not coded, nor were elements that modified B and C elements. In the first phase of the study no statistical use was made of the letters.

After manual coding, the SEAC computer was used for statistical analysis of the sentence numeric codes. After each group of 50 sentences, the computer printed out the total number of sentences processed and the number of unique patterns held in storage. Among the 550 sentences studied, 335 unique primary patterns were found.

"The maximum recurrence of any primary pattern was 12, for each of two patterns: 41665 (e.g., 'The dog has run across the street') and 414665 ('The dog with floppy ears has run across the street'). The next most common pattern showed 11 recurrences--16434 ('This is a dog with floppy ears'); and the next showed 10 recurrences--162 ('Dogs eat bones'). Thus the most common primary pattern represented only 2.2 percent of the whole sample and the rest of the patterns showed a roughly even distribution of nonsignificant recurrence."

A study was then made of the effect of "compressing" the primary letters; that is, considering two or more successive adjectival

expressions as a single adjective, or compressing a string of verbs into a single verb. The computer was programed to reject all but one of any digit contiguously repeated within a pattern. For example, 4441666550 becomes 41650000000, but 4146500000 is unchanged. A 1 was added to the tally of each primary pattern before compression, to show the actual number of occurrences in each case. The compressed patterns were then tallied with the following result:

percent	pattern	example
12.5	4165	The dog ran across the street.
9.2	41465	The dog with floppy ears ran across the street.
8.0	165	He ran across the street.
5.5	416424	The dog ate the bone which he had dug up.
5.0	162	Dogs eat bones.

Only 189 unique compressed patterns showed up, compared with the 335 primary patterns, and the first three of these patterns show that "about 30 percent of the sample comprised sentences built around verbs that lack objects but have adverbial modifiers."

It is hoped that continuing use of this method of examination "may shed some light on the problem of structural transformations in English." The electronic computer was found to be "admirably suited to this type of search."

OFFICE EQUIPMENT: BUY OR RENT?

Robert N. Anthony and Samuel Schwartz, Harvard Business School
Published by Management Analysis Center, Inc.

This is an excellent, clearly-presented book describing specific procedures for determining whether to rent or buy all types of office equipment. Theoretical considerations are explained but not belabored.

A clear procedure for determining whether to buy or rent

Methods for evaluating key factors in the rent vs. buy decision--namely: required earning rate relative to risk involved, the useful equipment life, cost factor and taxes--are described in a step-by-step fashion. Realistic approaches to the problems of technological life and depreciation rate are used.

Several methods of determining whether to rent or buy are given. A "short-cut" method covering the common situations is

developed, complete with work sheets and tables. For more complex cases, detailed methods are shown.

((This book is a natural extension of our Comment, "Some notes on renting versus buying an electronic data processing system," DPD March, 1957, pg 15.))

Price: $15.00 postpaid. Write: Management Analysis Center, Inc., 275 Newbury Street, Boston 16, Mass.

PRODUCTION CONTROL

William Voris, Los Angeles State College
Published by Richard D. Irwin, Inc., Homewood, Illinois, 1956

This book is an elementary, rather complete discussion of production control apparently written for the undergraduate level. It will serve as a (largely non-quantitative) review text for professional people who wish to become acquainted or reacquainted with production control problems.

Seven functions in planning and control

The author divides production planning and control into seven functions, the last six of which are the production control functions: 1. Original planning (converting sales data to overall manufacturing plans; master scheduling); 2. Supplementary planning ("control of inventories and tools" and "where, on what machine and by whom" work will be done); 3. Scheduling ("time coordination... in advance of performance"); 4. Dispatching ("issuance of authoritative paper"); 5. Instruction (at foreman level); 6. Progress inspection; 7. Correction.

These functions are analyzed for intermittent manufacturing plants, for continuous manufacturing plants, and for the small company. Also included are special chapters on inventory control (including brief discussions of ABC analysis and a simple form of economic order quantity) and on visual aids (charts) and mechanical aids (IBM, covered very briefly) to production control. Automation and its effect on production control is discussed in a thought-provoking manner. Unfortunately, the chapter on computers is rather sketchy, but a detailed case based on machine parts scheduling in a GE dishwasher assembly plant is given. The final chapter on Operations Research is also sketchy and at points misleading as to the areas of application of OR and the use of linear programing. However, two good cases are presented in the chapter.

Thought-provoking cases and good illustrations of forms are liberally provided throughout the book. Price: $7.20

COMPUTER COMPETITION FROM OTHER CONTINENTS

Everett S. Calhoun, Stanford Research Institute, Menlo Park, California
AUTOMATIC CONTROL, April 1957; pages 62-68.

The author made a 20-country tour to bring back a report on the status of computer research and use in Europe and Asia. He found that engineers in most countries he visited are familiar with the techniques of computer design. Lack of finances in some countries may force new manufacturing methods which will create a highly competitive situation. Computer developments are being undertaken in the main by these three groups: Scientific laboratories and universities; research laboratories or manufacturers who are building special purpose computers; electrical and business machine manufacturers. Countries which are leaders in the third category (including U. S., England, Germany, Japan and France) started research during or just after the war in their university laboratories. However, the author was disappointed to note that in these same countries, research by the universities has given way to purchase by the universities of standard manufactured computers. Some notes follow on specific work being done in Germany, Japan, India, France, Italy, Sweden, The Netherlands, England and Belgium.

WHAT KIND OF SHOP?

COMPUTING NEWS, June 15, 1957; pages 6, 7.

The controversy over "open" and "closed shop" in the computer field has nothing whatever to do with unionism, despite the similarity in the heat of the discussions between the two. This article lists briefly eight points that are the basis of open and closed shop controversies. In the open shop, a permanent staff oversees the administration of the computing center, but each department making use of the computer does its own programing and debugging. In the closed shop, the departments are considered "customers," and the computer staff does most of the programing. As is pointed out here, in the final analysis, the choice of type of operation must rest with the particular installation and the needs it must meet.

THE ASTONISHING COMPUTERS

William B. Harris
FORTUNE, June 1957; pages 136-139, 292-298.

The ups and downs of the computer industry are reviewed in this interesting article, including the battle between Remington Rand and IBM for top-dog position in the industry.

COMPUTERS COMING FOR GENERAL USE
WHEN CAN A CITY AFFORD A COMPUTER
AUTOMATION HELPS LOS ANGELES TEND TO ITS CIVIC AFFAIRS
CITIES ARE DISCOVERING A NEW OFFICE TECHNOLOGY
THE AMERICAN CITY, June 1957

While the four articles listed above do not present any new principles about office automation for city governments, they do reveal the trend toward solution of municipal data processing problems with electronic equipment.

THE ROAD TO AUTOMATION IN GOVERNMENT LIFE INSURANCE OPERATIONS

Melvin A. Niblett, Veteran's Administration
THE SPECTATOR, May 1957; pages 38-41, 54-57.

The VA's Department of Insurance has been gradually changing over from manual methods to mechanization, and expects eventually to have a fully integrated electronic installation. This move will be part of an agency-wide electronics program. At the present time premium accounting has been excepted from punch card mechanization and made the focal point of the electronics study.

AUTOMATION: ITS PURPOSE AND FUTURE

Magnus Pyke
Published by Philosophical Library (U.S.) and The Anchor Press (G.B.)

Written in a rather engaging and typically British style, this book runs the gamut of automation from oil refining to retailing, with a sketchy history of electronic computers and a philosophical look into the future thrown in for good measure. The content is general in nature, and seems slanted toward the public rather than toward professional business or automation people. Price: $10.00

Equipment

CHARACTERISTICS AND APPLICATIONS OF THE DATAFILE

Dean H. Shaw and William Rolph, ElectroData Division of Burroughs Corp.
Paper published by Los Angeles Chapter, Professional Group on Electronic Computers, I.R.E., February 1957.

Tape bin magnetic storage

The DataFile is a bin containing 50 free-end magnetic tapes, each tape 250 feet long and 3/4 inch wide. Each tape has two lanes of six channels each. The lanes are divided into blocks of twenty words. The blocks are addressable, as are the lanes and individual tapes. A block marker in the sixth channel signals the presence of the block address which is coded in the information channels of the lane. This number becomes the permanent address of the block of information it precedes. These addresses are recorded by the user during calibration, an operation that also checks the quality of the tape. Each DataFile can store 20,000,000 digits of information. As many as ten units may be attached to the Datatron computer. Information may be transferred to or from the tape at 6000 digits per second. Searching rate is doubled, in effect, by the double lanes. The tapes hang loose in individual bins. A moving pair of read-write heads is mounted on a single track beneath the tape guides, and is servo-positioned to any selected tape. The end of each tape has perforations which break the vacuum seal holding the tape against the heads. This stops the tape.

Average random-access time to any block of a completely packed DataFile is 16.3 seconds; less when not packed. For example, a file of five million digits would have an average random-access time of less than five seconds. Access time can also be reduced by spreading records over more than one DataFile, thus reducing tape travel.

Three computer-controlled instructions activate the DataFile: SEARCH (which leaves the computer free to continue operating on other information which does not involve the DataFile), READ and WRITE. As many as 100 blocks of information may be read or written with a single instruction. Searching, reading, and writing are all done at the rate of 46 milliseconds per block.

Several examples are given of the use of DataFile in inventory control, accounts payable, and data sorting.

To obtain a copy of the paper, write: George Eisler, Publications Chairman, I.R.E.-P.G.E.C., c/o National Cash Register Co., Hawthorne, California.

AUTOMATIC INPUT FOR BUSINESS DATA PROCESSING SYSTEMS

K. R. Eldredge, F. J. Kamphoefner, P. H. Wendt, Stanford Research Institute, Menlo Park, California

Technical description of machine reading

The work described in this paper was performed for the Bank of America, and is a technical explanation of the techniques developed at Stanford Research Institute to permit the entry of information into a computer directly from business documents in the form of conventional numbers and symbols printed in magnetic ink. Since the paper is written in a very concise and technical manner, it cannot be abstracted. However, it may be of value to mention the three phases of work on the computer input system. These were: 1) the development of techniques for the reliable machine reading of characters and symbols printed in magnetic ink; 2) the development of a series of magnetic inks suitable for character reading and compatible with a wide range of printing methods and practices; and 3) the development of electro-mechanical machinery to handle individual pieces of paper of varying sizes, weights, and degrees of mutilation.

A copy of the paper may be obtained from the Public Relations Office, Stanford Research Institute, Menlo Park, California.

Applications

1000 ITEMS A MINUTE!

MODERN RAILROADS, June 1957, pages 127-134.

The Southern Railway System is leasing an IBM 705. Its entire payroll job, covering 25,000 employees is being processed, and other tasks scheduled for the future include passenger revenue accounting, expenditure accounting, stockholders' records, freight accounting, financial and earnings forecasts, personnel and pension records, and special management reports and studies.

The computer is housed in a 47- by 68-ft. air-conditioned, well-lighted room in the Atlanta office. It includes 26 pieces of equipment, with ten more to be delivered this year. This includes 13 tape units, three 500-line-per-minute printers, card punch, card reader, and control and power units. The machines rest on a false floor, with all wiring underneath. An engineering room adjoining the computer room is headquarters for the four IBM technicians. Another large room is divided into cubicles for the programers and coders.

ELECTRONIC BOOKKEEPING FOR A LARGE BANK

BANKING, May 1957; pages 43, 146, 148.

The First National Bank of Atlanta has drawn up specifications for an electronic system and is seeking bids. The specifications include the following provisions: an improved system for maintaining commercial customer accounts; an "open end" system to allow expansion without basic revision; data origination with a minimum number of key strokes; by-product reports such as account analysis, check activity analysis for company and special accounts, uncollected funds, closed accounts, significant changes in accounts, etc. The system will serve an average of 100,000 accounts, with 220,000 daily items--190,000 updated items, 68,500 changes.

Programing

PROGRAMING THE COMMUTER

Sybil M. Rock and Wallace W. Klammer, ElectroData Div., Burroughs Corp.
CONTROL ENGINEERING, March 1957; pages 119-123.

Programing is only a part of the process of preparing problems for a computer. "The problem must first be explicitly and clearly formulated, the steps in the formulation placed into a logical sequence in outline or flow-chart form; then each step of the flow chart must be translated into the machine language or code." The coder's work can then "be minimized by use of subroutines, automatic programing, and compiling."

WHY AUTOMATIC PROGRAMMING?

COMPUTING NEWS, June 15, 1957; pages 8, 9.

The advantages of automatic programing are given in this brief but interesting article. Saving of time for the programer and greater accuracy in coding are two of the advantages. In addition, when programs are written symbolically, with standard symbols, several programers can work on the same problem and fit the parts together easily. Also, change of personnel has little effect on the preparation of a program in symbolic code.

Comment

WHAT IS THE "CLOUD 9" APPROACH?

A fair amount of confusion seems to exist about such terms as "integrated data processing," "electronic data processing," "blue sky" or "cloud 9 approach," and so on. Really, most of the confusion is due to misunderstanding of the relationship between levels of systems and procedures work and the type of data processing tools used.

Four levels of systems work

The chart on page 15 may help to relate these different terms. The chart shows four major levels of systems and procedures work, and four major types of data processing tools. The classifications shown here are only approximate, but should help to give a general idea of the meaning of such terms as IDP. The 16 blocks in the chart have been numbered, as an aid to the discussion.

1. From a practical standpoint, the level of systems and procedures work is related to the data processing tool used; it is almost impossible to install systems at levels 3 or 4 using manual or punched card means.

2. Block No. 7 defines what is usually meant by the popular term "Integrated Data Processing." It involves reasonably lower level systems work, in conjunction with devices using paper tape. In reality, however, the concept as it is seen in practice today falls far short of what might be called "true" integration, typified by levels 3 or 4.

3. Block No. 4 defines the usual EDP installation of today--the approach followed by companies that "want to learn to crawl before trying to walk." This approach also falls short of "true" integration. The effort involved is certainly not trivial and many practical problems are encountered in making such an installation.

4. Blocks 12 and 16 define the general area of "true" integration, and involve levels 3 and 4 of systems work. It is to these blocks that the names "cloud 9" and "blue sky" are often applied, implying that they are visionary or less practical. In reality, they simply involve higher levels of integration of data processing activities than do levels 1 and 2. However, developing reliable procedures for blocks 12 and 16 requires a much deeper understanding of the operation being mechanized than is true for, say, blocks 4 or 7.

Experience by the pioneer installations of EDP points out several interesting facts:

LEVELS OF SYSTEMS AND PROCEDURES WORK

DATA PROCESSING TOOLS

	MANUAL	PUNCHED CARD	PUNCHED TAPE: "WRITE IT ONCE"	ELECTRONIC DATA PROCESSING
Level 1 Clean up one or two activities, usually for cost reduction or higher speed (usual procedures work)	1. Usual procedures work	2. Usual punched card installation	3. Example: use of Flexowriters for Purchasing Dept. ((See: DPD, Nov. 1955, pg. 12--"An IDP order-invoice system"))	4. Usual EDP installation; "learn to crawl before walking" ((See: DPD, May 1957, pg. 11--"Case study of the electronic-computer system at Farmers Insurance Group"))
Level 2 Clean up flow of information through system, remove redundancy (beginning systems work; many activities involved)	5. Manufacturers of paper forms promote this concept a lot ((See: DPD, April 1956, pg. 8--"Automated Data Processing," published by Moore Business Forms))	6. Very few examples of this; possibly use of punched cards for production control	7. Usual "integrated data processing" installation ((See: DPD, Oct. 1955, pg. 14--"Integrated Data Processing"))	8. Not many examples here; one known in operation ((See: DPD, March 1957, pg. 3--"Administrative automation through IDP and EDP," Sylvania's communication system))
Level 3 Integration of procedures, file consolidation, for many activities (high level systems work)	9. Difficult to do with manual system; example of partial solution: Economic Order Quantity calculation	10. Very few advanced punched card installations	11. No examples known to DPD	12. Several known installations under way ((See: DPD, Oct. 1956, pg. 3--"Deciding upon an electronic data processing system," Pacific Mutual Life Insurance Company))
Level 4 Integration of whole business; simplified procedures, more sophisticated system (advanced systems work)	13. Difficult to do with manual system; example of partial solution: ABC technique for integrated production control and inventory control	14. Only one example known to DPD; no payoff yet known	15. No examples known to DPD	16. Two examples known to DPD; one in operation; no payoff yet known

1. Installing EDP at level 1 (block 4, the usual approach) is generally successful in getting the operation going quickly, and at minimum cost. However, when trying to expand a block 4 installation to block 12, say, almost as much trouble is encountered as if the block 12 installation were made in the first place.

2. Installing EDP at levels 3 or 4 (blocks 12 or 16) does take longer and cost more than a level 1 installation. However, the cost of going to block 4 first and then expanding to block 12 is more costly than going to block 12 directly.

3. It is practical to go to block 12 directly. It has been accomplished successfully both in cases of going from manual processing to EDP and in cases of going from punched card processing to EDP.

4. Evidence indicates that the closer one gets to the lower right hand corner of the chart, the greater is the payoff, in terms of direct savings and in intangible benefits.

CORRECT SPELLING VS POPULAR USAGE

If DPD seems to be inconsistent in its spelling of "programing" and occasionally "queuing," it's because the industry has not yet decided whether to be correct or habitual in its use of these words. "Programming" seems logical and comes naturally to the writer, but the dictionary says two "m's" are British and second choice for American usage. What does the poor abstractor do? Follow the rest of the sheep, or strike out on his own and use the preferred (by both Barnhart and Webster) form of one "m"? DPD chooses the way of the pioneer. When we quote directly from an article, or when we list a title which contains a 2-m "programming," we will retain the two "m's" as printed in the source material. When we use the word "programing" on our own, we will use the preferred American form.

As for "queuing," we can see no excuse for misspelling it "queueing" as we have seen it a number of times in print. However, the same rule will apply: when we quote, it will be spelled as the source gives it; when we use it on our own, we refuse to insert the extra and incorrect "e."

References

The addresses of publishers and periodicals mentioned in this issue of Data Processing Digest are listed below for your convenience in obtaining further information about the articles or books listed.

The American City
470 Fourth Avenue
New York 16, New York

Computing News
12805 - 64th Avenue South
Seattle 88, Washington

Fortune
540 North Michigan Avenue
Chicago, Illinois

Institution of Production Engineers Journal
10 Chesterfield Street
London W. 1, England

Journal of the Association for
Computing Machinery
Mt. Royal & Guilford Avenues
Baltimore 2, Maryland

Management Science
250 North Street
White Plains, New York

Modern Railroads
201 North Wells Street
Chicago 6, Illinois

Operations Research
Mt. Royal & Guilford Avenues
Baltimore 2, Maryland

Philosophical Library, Inc.
15 East 40th Street
New York 16, New York

The Spectator
Chestnut and 56th Streets
Philadelphia 39, Pennsylvania

Technical News Bulletin
National Bureau of Standards
Superintendent of Documents
U. S. Government Printing Office
Washington 25, D. C.

See DPD April 1957 for list of more than ninety periodicals regularly reviewed for significant information in the data processing and related fields.

DATA PROCESSING DIGEST is published each month by Canning, Sisson and Associates, 1140 South Robertson Boulevard, Los Angeles 35, California. Subscription rate: $24.00 per year. Foreign postage (exclusive of Canada and Mexico): $2.00 additional. Single copies: $3.00 when available. Editor: Margaret Milligan

Training

Summer Session, 1957, University of Michigan--"Intensive Courses for Men in Engineering, Science, and Business"

Date: August 19-30, 1957
Place: University of Michigan, Ann Arbor, Michigan
Courses in the Computer and Management Sciences:
Introduction to Digital Computer Engineering
Advanced Digital Computer Engineering and Logical Design
Introduction to the Electronic Digital Computer and Its Applications
Applications of Advanced Numerical Analysis to Digital Computer Problems
Applications of Logic to Advanced Digital Computer Programing
Management Sciences
Fee: For each of above courses, $200
Registration and Information: Co-ordinator of Engineering Summer Conferences, 2038 East Engineering Building, Ann Arbor, Michigan

Computer Applications, special course following the "Computers and Data Processing" Symposium (see Meetings)

Date: September 3-13, 1957
Place: University of Denver, Denver Research Institute
Instructors: First week--W. B. Kennedy and J. A. Williams
Denver Research Institute Computer Laboratory
Second week--Dr. John W. Carr III
University of Michigan (President of ACM)
Enrollment: Enrollment may be made for either or both weeks
Fees: Total course--$45 plus $10 for text; first week only--$20; second week only--$25.
Information: William B. Kennedy, Computer Laboratory Supervisor
Denver Research Institute, University Park
Denver 10, Colorado

Electronic Data Processing for Business and Industry (sponsored by Canning, Sisson and Associates)

Date: September 16-20, 1957
Place: New York City (Hotel Roosevelt)
Fee: $250
Program: Emphasis on the applications aspect of electronic data processing
For whom: Controllers, Methods and Procedures Supervisors, others in management charged with setting up an EDP system
Information: Canning, Sisson and Associates, 1140 South Robertson Blvd., Los Angeles 35, California

Operations Research, Special Program for Graduate Scientists and Engineers in Industry

Date: Sept. 16, 1957 to Jan. 24, 1958
Place: Case Institute of Technology
Prerequisites: Degree in Science or Engineering, knowledge of Mathematics through Differential Equations, knowledge of Introductory Statistics or Probability
Credit: Graduate credit for students able to satisfy Case's Graduate School entrance requirements
Fee: $1,000
Information and Registration: Dr. Russell L. Ackoff, Director, Operations Research Group, Case Institute of Technology, 10900 Euclid Avenue, Cleveland 6, Ohio

NOMA FILM RENTAL

"Integrated Data Processing," the film produced by the National Office Management Association (see DPD July 1957, page 16 for review) is now available for rental. Fees are $20 per day or $75 for five days. For further information write to: National Office Management Association, Willow Grove, Pennsylvania.

Meetings

WESCON--Western Electronic Convention

Date: August 20-23, 1957
Place: San Francisco, California
Information: WESCON, 342 North La Brea, Los Angeles 36, California

Computers and Data Processing, 4th Annual Symposium sponsored by University of Denver

Date: August 29, 30, 1957
Place: Denver Research Institute (University of Denver)
Information: J. Marshall Cavenah, Electronics Division, Denver Research Institute, University of Denver, Denver 10, Colorado

International Conference on Operational Research, sponsored by Operational Research Society, Operations Research Society of America, The Institute of Management Sciences

Date: September 2-6, 1957
Place: University of Oxford, England
Subjects: The common themes in operational research, methodology, applications

Conference on Matrix Computations

Date: September 3-6, 1957
Place: Department of Mathematics, Wayne State University
Information: Professor Wallace Givens, Chairman, Department of Mathematics, Wayne State University, Detroit 2, Michigan

Instrument Society of America, 12th Annual Instrument Conference

Date: September 9-13, 1957
Place: Cleveland, Ohio
Information: Herbert S. Kindler, Director of Technical Programs, Instrument Society of America, 313 Sixth Avenue, Pittsburgh, Pennsylvania

Automation Conference, National Office Management Association

Date: September 16, 17, 1957
Place: Hartford, Connecticut (Hotel Statler)
Fee: $60 (non-members of NOMA) $50 (NOMA members)
Registration: Limited to 125 NOMA members, 50 non-members
Information: National Office Management Association, Willow Grove, Pennsylvania

Systems and Procedures Association, 1957 International Systems Meeting

Date: October 7-9, 1957
Place: Los Angeles, California (Statler Hotel)
Information: Leslie Matthies, General Chairman, 1957 International Systems Meeting, 629 South Hill Street, Los Angeles 14, California

Third Electronics Business Systems Conference sponsored by the Western Division of National Machine Accountants Association

Date: November 7, 8, 1957
Place: San Diego, California (U. S. Grant Hotel)
Information: G. M. Blakesley, Third Electronic Business Systems Conference, P. O. Box 1448, San Diego 12, California

Operations Research Society of America, National Meeting

Date: November 14, 15, 1957
Place: Pittsburgh, Pennsylvania (Penn-Sheraton Hotel)
Theme: New tools and theory, new applications, and new areas of work

Eastern Joint Computer Conference--"Computers with Deadlines to Meet"

Date: December 9-12
Place: Washington, D. C. (Sheraton Park Hotel)
Information: Malcolm B. Catlin, Council for Economic and Industry Research, Inc., Arlington 2, Virginia